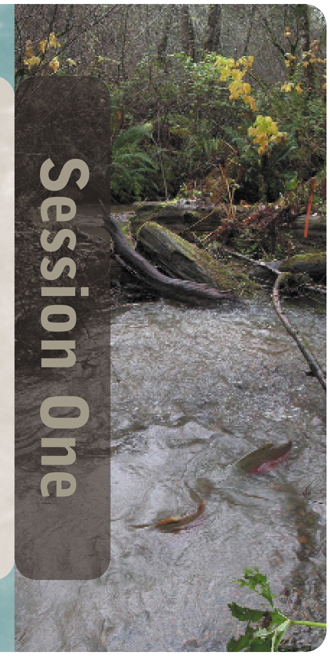

Conceptual framework(s) for cost analysis

Variables in Habitat Restoration Costs

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ABSTRACT

This paper discusses some of the variability in habitat restoration costs and the many factors that capture that variability, including project design, project time, and choice of implementation tools. The paper presents examples and experience from different restoration activities, and the funding of these projects, conducted through the Bonneville Power Administration in the Columbia River Basin.

INTRODUCTION

Out of the $125 million that the Bonneville Power Administration (BPA) spends under its Fish and Wildlife Program annually, $40-50 million is spent on habitat restoration activities. This amount of funding and resulting assessment and analysis has provided BPA with a good idea of the variables and costs in some of its programs.

As with other agencies and organizations, BPA is seeing an increase in engineering and design costs because of increasing necessity. Over the past year and in conjunction with the Northwest Power Planning Council, projects are now coming to BPA in phased budgets. This new format was precipitated by large construction projects with incredible cost overruns. Projects planned for $2 million would go to $16-20 million. Clearly, we needed to find a solution, so we began structuring projects and their projected budgets in phases. First, planning costs, then construction and implementation costs, then monitoring and evaluation costs, and finally operation and maintenance costs. This is the first year that we have required this of our project sponsors, and the transition has not been easy because, understandably, most biologists are better at doing the job than estimating the cost. But they are getting a lot better at it, and so are we. Our focus on the long-term aspects of a project makes it crucial that we balance our operation and maintenance costs so that there is money left for implementation.

COST VARIABLES

Hidden Costs and Variations in Experience

In any restoration project, it is important to examine the often hidden engineering and design costs that result from collaboration with other agencies. Such costs are often not clearly reflected. For example, BPA has a Natural Resources Conservation Service Stream Team (NRCSST) in southeast Washington, which contributes on average $400-500,000 a year over a series of projects in that area. In addition, the NRCSST provides limited technical and policy support out of the regional office in Portland to projects throughout the basin. Engineers hired from other federal agencies such as the Bureau of Reclamation, have provided engineering support and staffing in the Grande Ronde Model Watershed and the Lemhi Model Watershed. Those costs are separate, then, from other project costs and not reflected in the totals.

Cost variability can also come when using retired state or federal engineers. Often these retirees view such involvement as a sort of hobby. Hence, they charge much less (e.g. $35 per hour) for a retiree compared with an engineer from a professional engineering firm, that can cost as much as $150 per hour.

Experience can vary as well from one firm to another, impacting costs. On a project in north central Washington, one engineering firm bid $20 per foot on irrigation diversion costs, and another bid $3.50 per foot. A good deal of that variation was based on their relative experience (e.g., whether a firm has ever really worked in a rural area, or has experience limited to laying sewer pipe in the city).

Timing of Contracts

When a request for bid goes out, timing of that request can impact the cost because it impacts the availability of firms and individuals. Statistics show that when a call for bids goes out in a rush, higher bids are received just as they are late in the season. Early calls for bids may well produce lower bids. When you get behind in your scheduling and timing, your request for bid is going out to firms that may already have a full schedule. Invariably, they come in to you with higher bids. Early in the season, firms are hungry for jobs and are willing to come in at lower bids.

Acts of God

Unpredictable events will invariably affect project costs. For example, during a bad fire season such as the one we recently experienced, you might not be able to hire a contractor with a front-end loader, since they would all be on the fire lines somewhere. And if you did locate one, they might bid their costs extremely high, as the demand for their services was high. Another example is the 1996-97 flood season when every contractor was occupied. Projects during that period experienced incredible variability in costs.

Mechanized Versus Hand Labor

There's a real revolution and a lot of learning occurring in the cost of revegetating and planting trees in riparian areas. As an example, a project on Asotin Creek (SE Washington), for two or three years used hand labor from the Salmon Corps and high school students, which was relatively low cost. But, over time, the effectiveness of doing that was very, very low. We have switched to mechanized labor (for example, using a Cat ripper and plunger on Asotin Creek and Tucannon River) where it's physically feasible to use those methods. That doesn't mean to say that very innovative specialized equipment might not cost more, but the success rate may be high enough to balance out the increase in cost.

Type of Equipment

Additional cost variables arrives with equipment choices. How big a channel is being dug? What size of front-end loader is needed to get in there? Does access into the channel require a very specialized piece of equipment, such as a front-end loader, track hoe, or a spider? Some of those costs can change a great deal from time of estimation.

Availability of Materials and Access to Them

In a BPA project on the Grande Ronde River (NE Oregon), our only access method to large woody debris, in this case from a blow-down, was a very large Chinook helicopter. This was very expensive, but to meet the objective of that project, it was the only way to get those trees off the ridge. That's where arbitrary cost effectiveness is difficult to come by if we're to meet the objectives of a project and restore natural function to a channel.

Availability of materials can increase costs dramatically. The cost of hauling rock to an area may increase the price of that rock 2-3 times. And changes in Federal forest practice also impact variations in cost. Very little tree cutting is occurring, especially on West Side forests that are in the range of the spotted owl. This is the case in the upper Salmon as well. Materials have become very scarce due, in part, to changes in both state and federal land practices, thus driving up costs (if you can find material at all).

Time (and Money) Spent Searching for Materials

The scarcity of materials means spending time and money to find them. Of course, advance planning can be helpful as staff can keep an eye out for materials. Sometimes timing is accidental, and materials become plentiful and easily accessible. In one instance, a windstorm blew through an area about two weeks before a project was to take place, and it literally blew down about a thousand trees. All of a sudden, materials availability went up and the cost went down for that particular project.

Size of the site also has an impact. At our Soda Creek project we are working in a channel that is 20-30 feet wide in a flood-prone stage versus in the Grande Ronde, where a site is easily 2-3 times that large. In the systems up in the Yakima and some of the larger rivers, costs can go up considerably due to the size of the equipment needed, the size of the rock, the root balls in the logs, etc. Or if a large channel is very sensitive to sediment and diverting those flows becomes necessary, a new channel has to be created; in a smaller channel, a smaller diversion would be needed. The unpredictability of the work and the materials needed influences the costs.

Complexity of design and requested material may also substantially change project cost. Specialized materials for a highly engineered concrete and steel structure versus using natural materials for the same results will result in substantially different costs. Fencing a riparian exclosure can take on several different designs. A simple, portable electric fence may meet a projects need, or it may require a multiple strand smooth wire high tensile fence, or a log buck and pole fence. Costs for such fences will vary widely depending on access and location to the construction site and availability of materials if using natural materials such as log poles.

Land Purchases

A number of issues impact the cost of land purchases. Most obviously, the cost is always based on an appraisal and a comparison with like property values in the area. Then the value of the water has an influence. In the desert, for example, it takes 40 acres to graze a cow for one season. The land doesn't grow very much, but the value of this area is increased many times with the value of an aquifer and the clean storage of water.

Costs can vary considerably if contamination clean up is required. For example, we purchased a contaminated property near Hermiston, Oregon, a necessary political move. The clean up of such an area that must be purchased can significantly drive up costs.

A further issue occurs if an area is rich in culture and resources. This impacts how much restoration activity can take place, whether monitored excavations are needed, and how much that costs.

And if the state where the project is located has in lieu taxes, over time, this can considerably change the cost of purchasing the land. The federal government (BPA is a federal agency) generally does not pay state or local property taxes, but in some cases where Bonneville does not maintain ownership of a fish and wildlife mitigation purchase, the controlling entity does pay property taxes through the property's Operations and Maintenance budget. We do a lot of irrigation diversion screening. The costs vary by the size of the diversion you're taking out and whether or not you have access. Purchasing easements to get in to the site also contributes to the costs. In the Yakima, we've learned that land costs can differ considerably and that politics can play a part. We have been taken to court a few times, as the owner tried to get the money he thought was appropriate. Another factor can be the views of the judge as to federal government involvement, which may influence the price of a particular property.

Instream Structures

Another contributing factor is the availability of trained and experienced experts. In some projects in the Grande Ronde, we have literally cut the costs in half by assembling, over time, a group of contractors with the experience to put a project in. Experience in design and options in construction techniques are really helpful. There is an old joke that asks how many engineers it takes to put in a j hook vane (a small rock structure put into a stream to protect the bank and enhance habitat diversity). The answer — depends on how many engineers are around. If there are lots available, it will take four or five of them to do the job, but with experience, it may take only one. We're finding a lot of variability in cost effectiveness when we hire outside contractors or whether we have teams of agency people, or contributed agency design time, who can cost effectively design and implement the projects. In addition, some design standards require more materials. A conservation district, for instance, is required by law to have their design comply with the Natural Resources Conservation Service (NRCS) design standards. The NRCS has certain design standards that rely on a strict interpretation of engineering design standards. I'm not trying to denigrate the NRCS, but they are moving slowly as to certain advances in instream engineering designs. For example, some rock structures on the Tucannon River done five or six years ago would literally fill up a large conference room. However, today we are using a tenth of the materials to do the same kind of project because we are making better decisions in design. Another NRCS factor is that their regulations require multiple levels of review, which can add to the costs.

A lot of innovation during construction is occurring. If your project has team members who really know their stuff, it can save considerable money when they're putting the projects in.

Easements

The use of easements is quite common now in our wildlife program, and we're getting into it as well with the fisheries program. We talked about cooperating with the Conservation Reserve Enhancement

Program (CREP) which has allocated $500 million dollars to Washington, Oregon and Idaho. We are actively supplementing some of the costs of implementing CREP to make them more attractive to the landowners. This extent of project supplementation varies by state and by whether we do a project ourselves or whether we use those same standards or standards established by other regulatory agencies.

Another cost variable is the time period of the easement, whether the rancher or farmer is willing to accept a 10- or 15-year easement or whether he wants a permanent easement. In a project under current consideration in John Day, potential purchases there may be impacted by something new: developer rights in the easements. In other words, keeping development off these properties is going to increase the cost in some areas.

Variability in Costs on Habitat Restoration Projects

There can be a significant range of variability within the cost of stream restoration for projects that we fund right now. These projects include complete channel restoration, recreating natural form and function on a river. In a U.S. Army Corps of Engineers project here in Oregon, the cost has varied from $48 per linear foot in Southern Oregon to $100–140 per linear foot in Eastern Oregon. In an Oregon Department of Fish and Wildlife stream project in the Umatilla, the cost was upwards of $170 per linear foot; however, after some experience was gained in different areas, the cost was reduced to about $60 per foot. (Note: these figures may not reflect all costs.) For example, the cost of a project on the Red River, tributary to the Clearwater, ranged from $100 a foot upwards to $170 a foot. I would actually go up to $170 per foot for something that is actually going to last and actually produce some benefits for us.

David Rosgen in Colorado, the fluvial geomorphologist, has been one of the pioneers in the stream restoration techniques here in the Western United States. With his experience, he can get costs down to $17–$35 per foot, which shows the value of experience and innovation and ability to change. This kind of experience is highly valuable to have on a project. In two meander reconstruction projects on Asotin Creek, some of the crew had worked with Rosgen and we were able to get the costs down to about $37 per foot.

In another example project, we used an engineering firm and a retired engineer who was willing to keep the costs down. On Bear Creek in the Wallowa system, we put in a series of rock vortex weirs where there had been a channel widening due to channelization. The rock vortex weirs, facing downstream, decreased the channel width enough to create pool habitat at a cost of about $20 per foot.

I think we are learning on both the local and global area. On the BPA web site there are examples of projects (www.bpa.gov) where good cost assessments have been done. I believe we're getting a lot smarter about controlling our costs, and I think if we pay a little more attention to these things and look at the reports that are available, we can get a lot closer than we are at estimating costs.